CLAIMS

Having thus described the preferred embodiments, the invention is now claimed to be:

1. A system for reversing degraded energy resolution of semiconductor radiation detection elements **(44)** which are used in a radiation detector assembly, the system comprising:

a means **(38)** for identifying semiconductor elements which exhibit degraded energy resolution as compared to an initial level of energy resolution; and

a means **(40)** for restoring the degraded semiconductor elements to the initial level of energy resolution.

2. The system as set forth in claim 1, wherein the semiconductor elements **(44)** include an array of crystals selected from one of cadmium-zinc-telluride crystals and cadmium-telluride crystals.

3. The system as set forth in claim 1, wherein the restoring means **(40)** further includes:

a reverse bias means **(72)** which applies a reverse bias to the identified degraded elements for a preselected time.

4. The system as set forth in claim 3, wherein the restoring means **(40)** further includes:

a heater **(74)**, which supplies an elevated ambient temperature, when the reversed bias is applied to the identified degraded elements, to accelerate the recovery of the degraded elements.

5. The system as set up forth in claim 1, wherein the identifying means **(38)** includes a screening means **(48)** which facilitates identifying degradable semiconductor elements in a batch of new semiconductor elements, the screening means **(48)** including:

a forward bias means **(50)**, which applies a forward bias to the semiconductor elements to induce a degradation of energy resolution; and

a heater **(52)**, which increases an ambient temperature to accelerate the degradation of the energy resolution in the new semiconductor elements.

6. The system as set forth in claim 5, wherein the restoring means **(40)** further includes:

a reverse bias means **(72)** which applies a reverse bias to the identified degraded elements for a preselected time.

7. The system as set forth in claim 6, wherein the restoring means **(40)** further includes:

a heater **(74)**, which supplies an elevated ambient temperature, when the reversed bias is applied to the identified degraded elements, to accelerate the recovery of the degraded elements.

8. The system as set forth in claim 1, wherein the semiconductor elements **(44)** of the detector assembly are responsive to gamma radiation.

9. A method of restoring a degraded performance of semiconductor elements comprising:

identifying semiconductor elements which exhibit degraded energy resolution as compared to an initial level of energy resolution; and

restoring degraded semiconductor elements to the initial level of energy resolution.

10. The method as set forth in claim 9, wherein in response to identifying a semiconductor with reduced energy resolution, a service call is placed and the step of restoring is performed by a service technician.

11. The method as set forth in claim 9, wherein restoring includes one of replacing the identified degraded semiconductor elements and restoring the identified semiconductor elements.

12. The method as set forth in claim 9, wherein during manufacture or assembly, the identified degradable semiconductor elements are grouped based on identified degradation criteria and groups with common degradation criteria are installed in a detector assembly and the restoring step is applied uniformly to the detector assembly.

13. An apparatus for restoring performance of semiconductor elements including:

an identifying processor to detect elements with degraded performance which results after application of forward bias; and

a restoration processor which controls restoration of energy resolution of degraded elements to an initial level of energy resolution.

14. The apparatus as set forth in claim 13, wherein the identifying processor includes:

a pixel analyzer which analyzes a response of each semiconductor element when the semiconductor elements are subjected to a radiation source, which pixel analyzer determines a spectral response of each semiconductor element.

15. The apparatus as set forth in claim 14, wherein the identifying means further includes:

a performance analyzer which compares a spectral response of each semiconductor element with preselected spectral response criteria and calculates energy resolution of each semiconductor element.

16. The apparatus as set forth in claim 15, wherein the identifying means further includes:

a threshold processor which compares a calculated energy resolution for each semiconductor element with a predetermined energy resolution for each semiconductor element to identify non-degraded and degraded semiconductor elements.

17. The apparatus as set forth in claim 16, further including:

a reverse bias circuitry to restore the performance of degraded semiconductor elements, which reverse bias circuitry restores the performance by supplying the reverse bias to the identified degraded semiconductor elements for a preselected time.

18. The apparatus as set forth in claim 17, further including:

a heater to raise an ambient temperature to a preselected level when the reverse bias is supplied to the degraded semiconductor elements to accelerate the restoration process.

19. The apparatus as set forth in claim 18, further including:

a timer which monitors the application of the forward bias to the semiconductor elements for a preselected time and automatically engages the reverse bias circuitry and the heater to restore the identified degraded semiconductor elements, wherein the reverse bias circuitry and the heater are engaged for a predetermined time.

20. The apparatus as set forth in claim 13, wherein the forward bias is selectively supplied to semiconductor elements being selected for testing, which forward bias induces degraded performance in the tested semiconductor elements and further including:

a temperature control unit which increases an ambient temperature to accelerate performance degradation in the tested semiconductor elements.

21. The apparatus as set forth in claim 13, wherein the semiconductor elements include an array of crystals selected from one of cadmium-zinc-telluride crystals and cadmium-telluride crystals.